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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] In this invention, it is related to the manufacture method of the tube covering roller which provides to the heating fixing equipment which uses as a fixing image the non-established toner image of the image information which made record material (imprint material, a printing form, sensitized paper, electrostatic recording paper, etc.) carry out formation support by the imprint method or the direct method, and carries out heat fixing processing in the imaging process section in the image-formation equipment which adopted imaging processes, such as for example, an electrophotography method, electrostatic recording, etc.

[0002]

[Description of the Prior Art] The so-called heating fixing equipment of the heat mechanical control by roller which fixes as a permanent picture on record material is widely used by passing conventionally the nip section formed with the fixing roller (a heat roller, heating roller) which carries out the pressure welding of the record material which supported the non-established toner image mutually, and rotates in the fixing equipment provided to the image-formation equipment which adopts an electrophotography method, electrostatic recording, etc., and a pressurization roller.

[0003] Moreover, power is not supplied to heating fixing equipment especially at the time of standby, but the heating fixing equipment of the film heating method established in the toner image on record material through the film of thin meat between the heater section and a pressurization roller as equipment of the heating fixing method which stopped power consumption low as much as possible is proposed by JP,63-313182,A, JP,2-157878,A, JP,4-44075,A, the JP,4-204980,A official report, etc.

[0004] With such heating fixing equipment, since it is established on record material, without offsetting the toner on record material, mold-release characteristic layers which show the performance excellent in the mold-release characteristic, such as a polytetrafluoroethylene (PTFE) and a perfluoro alkoxy tetrafluoroethylene copolymer (PFA), are formed in the maximum surface of the above-mentioned fixing roller, a film, and a pressurization roller.

[0005] The mold-release characteristic layer is formed in the shape of a tube, or is formed of an electrostatic spray, dipping coating, etc.

[0006] Moreover, in order to prevent the offset generated because a fixing roller front face carries out a charge up by conveyance of record material, there are some which are mixing conductive member, such as carbon black, in a mold-release characteristic layer.

[0007] Or the pressurization roller which coated the front face of a pressurization roller with the mixture of a fluororubber like die ERURA tex GLS-213 (tradename by Daikin Industries, LTD.) and a fluoro resin etc. is adopted.

[0008] In order to satisfy high endurance and mold release stability to improvement in the speed of image formation equipment especially, many pressurization rollers which covered the tube with recently are adopted.

[0009] The lamination model view of an example of the above-mentioned pressurization roller is shown in drawing 5. The pressurization roller 40 forms the mold-release characteristic layers 43, such as PTFE, or PFA, FEP, in the outer layer in the shape of a tube, and grows into the sponge elastic body layer 42 and pan which foam in the elastic body layer or silicone rubber which fabricated silicone rubber and the fluororubber, and grow into the exterior of rodding 41.

[0010] It is made to stand straight inside. as the manufacture method of this pressurization roller 40 -- metal rodding, such as aluminum, -- cylinder-like metal mold -- [ whether it is made to harden by making the gap of rodding and metal mold pour in and vulcanize liquefied silicone rubber, and ] or closed-end cylinder-like metal mold -- inside -- beforehand -- after pouring in the liquefied silicone rubber of the specified quantity -- rodding -- this -- metal mold -- it inserts inside, and the gap of rodding and metal mold is made to carry out elevation restoration of the liquefied silicone rubber, and it is made to harden by making it vulcanize The method of forming by making the front face equip with the tube which consists of fluororesins, such as PFA as the above-mentioned mold-release characteristic layer and PTFE,

furthermore is learned.

[0011] However, there is a trouble that it explains below, by the above-mentioned manufacture method.

[0012] That is, it has bad workability that the surface of silicone rubber adheres to metal mold in case it unmolds from metal mold, after stiffening liquefied silicone rubber, and sampling cannot attain easily etc., and there are problems, such as spoiling the quality of a pressurization roller further.

[0013] Moreover, the work which covers a fluororesin tube is difficult for the pressurization roller unmolded from metal mold, distortion is produced in a tube or there are troubles -- the adhesive property of silicone rubber and a tube is not fully acquired.

[0014] For this reason, the method of performing simultaneously formation of the above-mentioned silicone rubber and covering of a fluororesin tube is indicated by JP,50-7097,A, JP,51-27276,A, JP,61-169863,A, etc.

[0015] that is, in drawing 6, it forms so that the metal mold 52a and 52b of a vertical edge may fit into the cylinder-like metal mold 51 -- having -- \*\*\*\* -- an edge -- the inlet 53 of liquefied silicone rubber is formed in metal mold 52a as the pressurization roller manufacture method -- an edge -- metal mold -- the fluororesin tube 43 by which the primer application was carried out after the rodding 41 set to 52a from aluminum etc., and inside etching -- one by one -- equipping -- a cylinder -- the edge where the end of metal mold 51 was equipped with rodding 41 and the fluororesin tube 43 -- metal mold -- 52a is fitted in next, a cylinder -- metal mold 51 -- obtaining -- opening of an end -- an edge -- metal mold -- 52b -- fitting in -- an edge -- metal mold -- pouring restoration of the liquefied silicone rubber 42 is carried out by high pressure from the inlet 53 of 52a in the gap of the above-mentioned rodding 41 and the fluororesin tube 43 While making it stick to the inner skin of circle metallic tube type 51, making the fluororesin tube 43 extend by this filling pressure, the fluororesin tube 43 is made to unite with the silicone rubber material 42.

[0016] Or the porosity elastic body (silicon sponge) which comes to foam to silicone rubber is formed on rodding, and it grinds in a predetermined outer-diameter size. On the other hand, it considers as the state where the non-shrinkage-characteristics fluororesin tube of a minor diameter was extended within the reduced pressure container from the outer diameter of this elastic body, and a roller [ finishing / the above-mentioned polish ] is inserted into a tube. It returns to an ordinary pressure after the completion of insertion, and a fluororesin tube is stuck on the superficies of a sponge elastic body layer.

[0017] The pressurization roller provided to heating fixing equipment by the above is manufactured.

[0018]

[Problem(s) to be Solved by the Invention] However, the following problems occur by the manufacture method of the pressurization roller mentioned above.

[0019] That is, it is very difficult at the time of equipping a circle metallic tube type with a fluororesin tube, the time of the handling in a manufacturing process, etc. to work without a pressurization roller fabrication operation company touching on the surface of a fluororesin.

[0020] Moreover, since a circle metallic tube type inside touches a direct pressurization roller front face at the time of molding, the blemish and affix of a circle metallic tube type inside may be imprinted on a pressurization roller front face as it is.

[0021] The mold release performance of the fluororesin layer front face of a pressurization roller may fall for the above problem. in this case -- the time of a toner picture offsetting in the fixing nip section of heating fixing equipment, and the time of removing this record material from fixing nip delivery, when image-formation equipment causes a paper jam in the state where of a non-established toner is in record material -- once -- fixing -- the toner which adhered on the surface of the member being carried to a pressurization roller front face, turning into a pollution toner on a pressurization roller front face, and becoming easy it adhering If the mold-release characteristic of a pressurization roller is fully maintained at this time, although a pollution toner will adhere to the tooth back (field which touches a pressurization roller) of the record material conveyed next and a pressurization roller front face will return to the beautiful front face which does not have a pollution toner again, when the pressurization roller front face has got damaged as mentioned above or there is an affix, since sufficient mold-release characteristic is not acquired, a pollution toner will not be able to be removed, and a pollution toner will accumulate. As a result, when the worst, the adhesive strength by the \*\*\*\* toner may increase between record material and a pressurization roller front face, and the problem of record material coiling around a pressurization roller front face may occur.

[0022] Although the cure by cleaning a front face etc. is also after pressurization roller manufacture in order to avoid the above, it is difficult to remove a surface affix completely. Moreover, the blemish of the pressurization roller front face attached by the circle metallic tube type does not improve at a cleaning process.

[0023] Then, this invention aims at obtaining the heating fixing equipment possessing the fluororesin tube covering roller on which the mold-release characteristic on the front face of a roller was fully maintained, and this roller, without [ therefore ] making a front face produce an affix and a blemish.

[0024]

[Means for Solving the Problem] this invention is heating fixing equipment which has the manufacture method of a tube covering roller, tube covering roller, and tube covering roller which are characterized by following means and composition.

[0025] (1) the manufacture method of the tube covering roller which forms the mold-release characteristic layer which becomes the superficies of metal rodding from an elastic body layer and a fluororesin tube -- it is -- the superficies of this fluororesin tube -- a heat resistant resin -- beforehand -- ed -- the manufacture method of the tube covering roller characterized by performing the adhesion process of an elastic body layer and a fluororesin tube inside in the state the bottom

[0026] (2) the shape of a cylinder -- the metal mold which makes an each plug come to fit into the ends side of metal mold -- this -- a bore from metal mold with the process equipped with the fluororesin tube and metal rodding which have the bore which is not size the ends side of this fluororesin tube -- being extended -- the edge -- a tube fixed means -- this, while fixing to metal mold It is the manufacture method of a tube covering roller of having the process stiffened where inside is sealed. this metal rodding -- a cylinder -- after pressing liquid rubber fit mostly in the process of metal mold made to carry out erection maintenance in the center, and the gap of this fluororesin tube and this metal rodding -- this -- metal mold -- The manufacture method of the tube covering roller characterized by having the process which removes this cylinder-like tube after making a heat-resistant cylinder-like tube intervene between above-mentioned circle metallic tube type insides with the above-mentioned fluororesin tube and unmolding from metal mold after the above-mentioned liquid rubber hardening process.

(3) (1) characterized by the melting point of the cylinder-like tube formed in the external surface of a fluororesin tube being 200 degrees C or more, or the manufacture method of a tube covering roller given in (2).

[0027] (4) The tube covering roller characterized by being manufactured by the manufacture method the above (1) or given in either of (3).

[0028] (5) By passing between the fixing nips which come mutually to carry out the pressure welding of the record material in which the non-established picture was formed by the fixing member and the pressurization member the tube covering roller manufactured by the manufacture method of a publication by the above (1) or either of (3) in the heating fixing equipment which fixes the above-mentioned non-established picture as a permanent picture on record material -- the above-mentioned pressurization -- the heating fixing equipment characterized by providing as a pressurization roller of a member

[0029] (6) The manufacture method of the tube covering roller characterized by having the process which covers the fluororesin tube which covered the heat-resistant cylinder-like tube outside, and the process which pastes up the above-mentioned elastic body layer and a fluororesin tube, and removing the above-mentioned cylinder-like tube after the above-mentioned adhesion process on the roller in which the elastic body layer was formed on metal rodding.

[0030] (7) The manufacture method of a tube covering roller given in (6) characterized by the melting point of the cylinder-like tube formed in the superficies of a fluororesin tube being 200 degrees C or more.

[0031] (8) The tube covering roller characterized by being manufactured by the manufacture method the above (6) or given in (7).

[0032] (9) By passing between the fixing nips which come mutually to carry out the pressure welding of the record material in which the non-established picture was formed by the fixing member and the pressurization member the tube covering roller manufactured by the above (6) or (7) by the manufacture method of a publication in the heating fixing equipment which fixes the above-mentioned non-established picture as a permanent picture on record material -- the above-mentioned pressurization -- the heating fixing equipment characterized by providing as a pressurization roller of a member

[0033] (10) the shape of a cylinder -- the metal mold which makes an each plug come to fit into the ends side of metal mold -- this -- a bore from metal mold with the process equipped with the fluororesin tube and metal rodding which have the bore which is not size the ends side of this fluororesin tube -- being extended -- the edge -- a tube fixed means -- this, while fixing to metal mold It is the manufacture method of a tube covering roller of having the process stiffened where inside is sealed. this metal rodding -- a cylinder -- after pressing liquid rubber fit mostly in the process of metal mold made to carry out erection maintenance in the center, and the gap of this fluororesin tube and this metal rodding -- this -- metal mold -- the superficies of the above-mentioned fluororesin tube -- metal mold -- the manufacture method of the tube covering roller which has carried out coating processing of the resin coat at the process before wearing, and is characterized by removing this resin coating member from metal mold after unmolding a tube covering roller

[0034] (11) The tube covering roller characterized by being manufactured by the manufacture method given in the above (10).

[0035] (12) By passing between the fixing nips which come mutually to carry out the pressure welding of the record material in which the non-established picture was formed by the fixing member and the pressurization member the tube covering roller manufactured by the above (10) by the manufacture method of a publication in the heating fixing

equipment which fixes the above-mentioned non-established picture as a permanent picture on record material -- the above-mentioned pressurization -- the heating fixing equipment characterized by providing as a pressurization roller of a member

[0036] (13) The manufacture method of the tube covering roller characterized by having the process which covers outside the fluororesin tube which has carried out coating processing of the resin coat, and the process which pastes up the above-mentioned elastic body layer and a fluororesin tube, and removing the above-mentioned resin coating material after the above-mentioned adhesion process on the roller in which the elastic body layer was formed on metal rodding.

[0037] (14) The tube covering roller characterized by being manufactured by the manufacture method given in the above (13).

[0038] (15) By passing between the fixing nips which come mutually to carry out the pressure welding of the record material in which the non-established picture was formed by the fixing member and the pressurization member the tube covering roller manufactured by the above (13) by the manufacture method of a publication in the heating fixing equipment which fixes the above-mentioned non-established picture as a permanent picture on record material -- the above-mentioned pressurization -- the heating fixing equipment characterized by providing as a pressurization roller of a member

[0039] (16) the shape of a cylinder -- the metal mold which makes an each plug come to fit into the ends side of metal mold -- this -- a bore from metal mold with the process equipped with the fluororesin tube and metal rodding which have the bore which is not size the ends side of this fluororesin tube -- being extended -- the edge -- a tube fixed means -- this, while fixing to metal mold It is the manufacture method of a tube covering roller of having the process stiffened where inside is sealed. this metal rodding -- a cylinder -- after pressing liquid rubber fit mostly in the process of metal mold made to carry out erection maintenance in the center, and the gap of this fluororesin tube and this metal rodding -- this -- metal mold -- The manufacture method of the tube covering roller characterized by making the heat-resistant-resin member which has a diameter of a roller result, and this bore in an above-mentioned circle metallic tube type inside provide.

[0040] (17) The manufacture method of a tube covering roller given in (16) characterized by installation and removal of the heat-resistant-resin member provided in a circle metallic tube type inside being possible.

[0041] (18) The tube covering roller characterized by being manufactured by the manufacture method the above (16) or given in (17).

[0042] (19) By passing between the fixing nips which come mutually to carry out the pressure welding of the record material in which the non-established picture was formed by the fixing member and the pressurization member the tube covering roller manufactured by the above (16) or (17) in the heating fixing equipment which fixes the above-mentioned non-established picture as a permanent picture on record material -- the above-mentioned pressurization -- the heating fixing equipment characterized by providing as a pressurization roller of a member

[0043] <\*\*\*> In case a circle metallic tube type is equipped with pressurization roller rodding and a fluororesin tube, the outside of a fluororesin tube is already simultaneously equipped with much more fluororesin tube or a heat-resistant-resin tube. Next, it becomes slight, though there is no affix in the fluororesin tube front face in the state where the resin tube of the maximum surface with which circle metallic tube type the affix and blemish of an inside were imprinted by removing the resin tube formed in the maximum surface was removed and a blemish is also, after unmolding from metal mold after vulcanization hardening. Thereby, since the mold-release characteristic of a pressurization roller front face is fully maintained, an offset toner etc. becomes that it is hard to be accumulated on a pressurization roller.

[0044] b) or fluororesin tube already much more on the superficies of a fluororesin tube in case the superficies of the porosity elastic body layer which foamed to silicone rubber or silicone rubber are made to cover a fluororesin tube or a heat-resistant-resin tube -- beforehand -- ed -- maintain at a state the bottom, and remove the heat-resistant-resin tube of the maximum surface after carrying out covering processing at the above-mentioned elastic body layer Thereby, in case a tube is covered in the above-mentioned elastic body layer, when the fabrication operation company touched the tube of this duplex, or even when the dirt of the tube attachment component at the time of inserting an elastic roller in this double tube adheres to a tube front face, there is already no above-mentioned affix on the fluororesin tube after removing the heat-resistant-resin tube on the front face of the maximum.

[0045] For this reason, since a mold-release characteristic with the good pressurization roller front face in the state where it included in heating fixing equipment like the above is acquired, accumulation of an offset toner etc. is mitigable.

[0046] c) Or equip a circle metallic tube type inside with the cylinder-like member which consists of a heat resistant resin with which a circle metallic tube type inside can be equipped, and manufacture a pressurization roller like the conventional method. Moreover, the cylinder-like member of the above-mentioned heat resistant resin removes a

pressurization roller from metal mold from a circle metallic tube type after unmolding, and changes it for the cylinder-like member of a new heat resistant resin. Since it can manufacture after the fluororesin tube front face formed in a pressurization roller front face has been contacted by inner skin with the beautiful cylinder-like member of a heat resistant resin new thereby always, dirt does not adhere to a fluororesin tube or a blemish is not attached.

- [0047] Even when the durability of the pressurization roller manufactured by the above-mentioned method by this is incorporated and carried out to heating fixing equipment, mold-release characteristic sufficient with an offset toner etc. to prevent toner contamination is acquired, and accumulation of toner contamination can be mitigated. Since it is not necessary to pile up a still thinner tube doubly beforehand, workability becomes good. Moreover, it is also possible for the cylinder-like member which consists of the above-mentioned resin to carry out number-of-times use of fixed depending on the quality of the material.

[0048] d) Or apply a resin coating material to the superficies of a fluororesin tube, by the above-mentioned method, remove resin coating of fluororesin tube superficies and obtain a pressurization roller, after manufacturing a pressurization roller.

[0049] Thereby, the protective layer protected from an affix adhering or a blemish being attached can be easily formed in a fluororesin tube front face.

[0050]

[Embodiments of the Invention] <The 1st operation gestalt> (drawing 1 - drawing 3)

(1) Example drawing 1 of image formation equipment is the outline block diagram of the example of image formation equipment. The image formation equipment of this example is the laser beam printer of imprint formula electrophotography process use.

[0051] 1 is an electrophotography photo conductor (it is hereafter described as a photoconductor drum) rotating-drum type [ as an image support ]. Sensitive-material layers, such as OPC, amorphous Se, and an amorphous silicon, are formed on the conductive base of the shape of a cylinder, such as aluminum and nickel. The rotation drive of this photoconductor drum 1 is carried out with a predetermined peripheral velocity (process speed) at the clockwise rotation of an arrow.

[0052] In rotation process, as for a photoconductor drum 1, the front face is first charged uniformly in predetermined polarity and potential with the electrification roller 2 as electrification equipment.

[0053] Next, the laser-beam scanning exposure 3 corresponding to the image information pattern to be based on the non-illustrated laser scanner as an aligner is received. Thereby, the electrostatic latent image corresponding to the target image information pattern is formed in the 1st page of a rotation photoconductor drum.

[0054] A laser scanner outputs the laser beam by which ON/OFF control was carried out corresponding to the time series electrical-and-electric-equipment digital pixel signal of an image information pattern to have been sent from external devices, such as a host computer, etc., and carries out scanning exposure of the uniform electrification processing side of the rotation photoconductor drum 1 by this laser beam.

[0055] By the developer 4, the toner development of the electrostatic latent image formed in the 1st page of a rotation photoconductor drum is carried out, and it is visualized. As the development method, the jumping developing-negatives method, the 2 component developing-negatives method, the FEED developing-negatives method, etc. are used, and it is used in many cases combining image exposure and reversal development.

[0056] The toner image formed in the 1st page of a rotation photoconductor drum is imprinted one by one to the record material (imprint material) P with which this imprint nip section T was fed from the non-illustrated feed section to predetermined control timing in the imprint nip section T formed with a photoconductor drum 1 and the imprint roller 5 as imprint equipment contacted to the photoconductor drum 1 with fixed welding pressure.

[0057] Predetermined imprint bias is impressed to the imprint roller 5 from a non-illustrated power supply to predetermined control timing, and the toner image of the 1st page of a photoconductor drum is imprinted one by one in the imprint nip section T in an operation of this imprint bias by the record material P side by which pinching conveyance is carried out.

[0058] 8 is a sensor which detects the nose of cam of the record material P conveyed by the imprint nip section T from the feed section, detected the nose of cam of the record material P as the image formation position of the toner image on a photoconductor drum 1 and the beginning position at the nose of cam of the record material P agreeing by the sensor 8, and has doubled timing.

[0059] It dissociates from the 1st page of a rotation photoconductor drum, the record material P which passed the imprint nip section T in response to the imprint of a toner image in the imprint nip section T is conveyed to heating fixing equipment 6, and it is fixed to a toner image as a permanent picture.

[0060] On the other hand, the remains toner of the imprint remainder which remains on a photoconductor drum 1 is removed from photoconductor drum 1 front face by cleaning equipment 7.

[0061] (2) The heating fixing equipment 6 in the example of six heating fixing equipments is equipment of the film

heating method, pressurization roller drive formula, and tension loess type which used the cylinder-like fixing film of an indication for the JP,4-44075,A - No. 44083 official report etc. Heating fixing equipment may be equipment of a heat mechanical control by roller etc.

[0062] Drawing 2 is the cross-section model view of this equipment 6. the fixing member and pressurization in which 10-20 was made to contact mutually and the fixing nip section N was made to form -- it is a member

[0063] fixing -- the member 10 consists of a heating object 11, a heat insulation SUTEI electrode holder 12, and fixing film 13 grade pressurization -- a member 20 is an elastic pressurization roller

[0064] The heating objects 11 are light-gage and an oblong ceramic heater (it is hereafter written as a heater).

[0065] The heat insulation SUTEI electrode holder 12 holds a heater 11, are a nip and a member which prevents the thermolysis to opposite direction, and is formed of a liquid crystal polymer, phenol resin, PPS, PEEK, etc. The cross-section abbreviation half circular \*\* type of the heat insulation SUTEI electrode holder 12 of this example is oblong, they are thermal resistance and electric insulation, is the member which can be equal to a high load, and a heater 11 makes a front-face side expose downward to the slot of the inferior surface of tongue of this heat insulation SUTEI electrode holder 12 mostly established in the center section along with the section length-of-member hand, and it has inserted and carried out fixed support.

[0066] Making the fixing film 13 have attached outside loosely in the form where the margin was given to the circumference to the heat insulation SUTEI electrode holder 12 which is a heat-resistant cylinder-like film and contains a heater 11, the heat insulation SUTEI electrode holder 12 supports the fixing film 13 from an inside.

[0067] The heat capacity of the fixing film 13 is small, and in order to make the quick start possible, it is a film which used as the substratum the polyimide which has thermal resistance and thermoplasticity by thickness with a total thickness of 100 micrometers or less, a polyamidoimide, PEEK, PES, PPS, PFA, PTFE, FEP, etc. Moreover, thickness with a total thickness of 20 micrometers or more is required as a film which had sufficient intensity since long lasting heating fixing equipment was constituted, and was excellent in endurance. Therefore, as the total thickness of the fixing film 13, 20 micrometers or more 100 micrometers or less are the optimal. In order to secure the separability of offset prevention or record material furthermore, on a surface, the good heat-resistant resin of mold-releases characteristic, such as PFA, PTFE, FEP, and silicone resin, is covered with mixture or independent.

[0068] It explains in full detail further by the composition of the elastic pressurization roller 20 as a pressurization member, the manufacture method, therefore the following (3) terms.

[0069] The elastic pressurization roller 20 is made to hold to non-illustrated bearing material, makes the fixing film 13 insert to the downward front face of the heater 11 which carried out fixed support at the inferior-surface-of-tongue side of the heat insulation SUTEI electrode holder 12, and is fully pressurized to form the fixing nip section N required for heating fixing from longitudinal direction both ends by pressurization means by which it does not illustrate.

[0070] The rotation drive of the pressurization roller 20 is carried out by non-illustrated driving means at the counterclockwise rotation of an arrow. Turning effort acts on the fixing film 13 with the pressure-welding frictional force in the fixing nip section N of the superficies of this roller 20 by the rotation drive of this pressurization roller 20, and the superficies of the fixing film 13. This fixing film 13 will be in a follower rotation state to the clockwise rotation of an arrow about an area around of the heat insulation SUTEI electrode holder 12 with the peripheral velocity corresponding to the rotation peripheral velocity of the pressurization roller 20 mostly, while the inside sticks and slides on the downward front face of a heater 11 in the fixing nip section N.

[0071] In this case, the fixing film 13 of the shape of a cylinder which carries out follower rotation of the area around of the heat insulation SUTEI electrode holder 12 has fixing film portions other than the fixing film portion of the fixing nip section N and the near section of the circumference in a tension free-lancer's (state where a tension is not added) condition.

[0072] The fixing film 13 needs to stop small the frictional resistance between a heater 11 and the heat insulation SUTEI electrode holder 12, and the fixing film 13, in order for the inside side to rotate, while the superficies of a heater 11 and the heat insulation SUTEI electrode holder 12 \*\*\*\* in part. For this reason, the front face of a heater 11 and the heat insulation SUTEI electrode holder 12 is made to have carried out little mediation of the lubricant, such as high temperature grease. Thereby, the fixing film 13 becomes possible [ rotating smoothly ].

[0073] It \*\*, the rotation drive of the pressurization roller 20 is carried out, and the cylinder-like fixing film 13 will be in a follower rotation state about an area around of the heat insulation SUTEI electrode holder 12 in connection with it. In the state where energization was made by the heater 11, and the \*\* tone of the temperature of the fixing nip section N was started and carried out to predetermined by generation of heat of this heater 11 The record material P which carried out formation support of the non-established toner image is introduced into the fixing nip section N along with the heat-resistant fixing entrance guide 15. In the fixing nip section N, the non-established toner image support side side of the record material P sticks to the superficies of the fixing film 13, and pinching conveyance is carried out in the fixing nip section N together with the fixing film 13.

[0074] In the pinching conveyance process of this record material P, the heat of a heater 11 is given to record material through the fixing film 13, and heat-and-pressure fixing of the non-established toner image on the record material P is carried out.

[0075] If the fixing nip section N is passed, the record material P will carry out curvature separation from the superficies of the fixing film 13, and will be discharged on a non-illustrated ejection tray.

[0076] A heater 11 (ceramic heater) is the member for energization heating which carried out coating of the energization exoergic resistive layers, such as Ag/Pd (silver palladium), RuO<sub>2</sub>, and Ta<sub>2</sub>N<sub>5</sub>, to a line or thin band-like one with a thickness [ of about 10 micrometers ], and a width of face of about 1-5mm, and formed them in the front face of ceramic substrates of high insulation, such as an alumina, by screen-stencil etc. along with the longitudinal direction.

[0077] The temperature detection elements 14, such as a thermistor for detecting the temperature of the ceramic substrate which carried out the temperature up according to generation of heat of an energization exoergic resistive layer, are arranged in the tooth back of a ceramic substrate. By controlling appropriately duty ratio, the wave number, etc. of the voltage impressed to an energization exoergic resistive layer from the polar zone which is not illustrated in a longitudinal direction edge according to the signal of this temperature detection element 14, the \*\* tone temperature within the fixing nip section N is maintained at abbreviation regularity, and heating required to establish the toner image on record material is performed.

[0078] The non-illustrated connector has attained DC energization to the non-illustrated temperature-control section [ element / temperature detection / 14 ] through non-illustrated DC energization section and DC polar zone. Moreover, protective layers, such as a glass coat of the thin layer which can bear \*\*\*\* with the fixing film 13, are prepared in the front face of the energization exoergic resistive layer of the heater 11 for heating.

[0079] (3) The pressurization roller 20 and the elastic pressurization roller 20 as the manufacture method pressurization member consist of an elastic body layer 22 which foamed to heat-resistant rubber or silicone rubber, such as silicone rubber and a fluororubber, and was formed in rodding 21, and form the fluoro-resin mold-release characteristic layers 23, such as a perfluoroalkoxy resin (PFA), a polytetrafluoroethylene resin (PTFE), and a tetrafluoroethylene-hexafluoropropylene resin (FEP), on this. The fluoro-resin mold-release characteristic layer 23 adds conductive grant material, such as conductive carbon black, if needed, and is good also as a conductive fluoro-resin.

[0080] The manufacture method of the pressurization roller 20 is explained using drawing 3. (a) of drawing 3 is the longitudinal-section model view of the equipment under pressurization roller manufacture, and 21, 22, and 23 are the fluoro-resin tubes as rodding of the pressurization roller 20 built into heating fixing equipment as stated above which consists of metals, such as aluminum, respectively, the silicone rubber which was made to carry out heat hardening of the liquefied silicone rubber, and was formed, and a mold-release characteristic layer.

[0081] As for the thickness of the fluoro-resin tube 23, it is desirable to form in 10 micrometers or more 200 micrometers or less in order to satisfy endurance, and to form a fixing nip and to maintain the product degree of hardness of a pressurization roller below at a predetermined value.

[0082] How to carry out the chemical treatment of the inside of the fluoro-resin tube 23 with the solution made to dissolve metallic sodium and naphthalene in THF or the ethylene glycol wood ether like Tetrapod H (tradename made from \*\*\*\* [ Co. ], Inc.), How to carry out a chemical treatment with the solution made to dissolve metallic sodium in liquid ammonia, How to carry out a chemical treatment by the mercury amalgam of alkali metal like a lithium, An electrolytic reduction method, a corona discharge approach, the method of processing with inert gas plasma like helium or an argon, It is KEMUROKKU in order to heighten adhesive strength with the elastic body layer 22, after inside processing is carried out by the method of processing with an excimer laser etc. A silicone system primer like 607 (Load Far East, Incorporated tradename) is applied.

[0083] 24 is a cylinder-like tube which consists of a heat-resistant resin, and is \*\*. It is polyester resin, such as polyamide resin, such as fluoro-resins, such as PFA, PTFE, and FEP, nylon 6, Nylon 66, nylon 8 (N-METOROKISHI methylation nylon), Nylon 11, Nylon 12, and an aromatic polyamide, a polyethylene terephthalate, and a polybutylene terephthalate, polyphenylene sulfide (PPS), polyimide resin, etc., and is [ whether it is almost equivalent to the outer diameter of the fluoro-resin tube 23 and ] a large cylinder tube a little.

[0084] The thickness of this cylinder-like tube 24 should just be thickness which is easy to deal with it although there is especially no limitation. The inside of the cylinder-like tube 24 is in the state where nothing is processed or the release agent was applied, and is beforehand put on the outside of the above-mentioned fluoro-resin tube 23. Or the metal mold explained below is equipped with the fluoro-resin tube 23 and the cylinder-like tube 24 one by one, and they are put on it.

[0085] \*\*. -- the pressurization roller rodding 21 which applied added type adhesives to the peripheral face beforehand as the manufacture method of the pressurization roller 20 -- the edge which can fit into the vertical edge of the cylinder-like metal mold 31 -- the edge of one of the two of metal mold 32a and 32b -- attach in metal mold

[0086] \*\* -- the fluororesin tube 23 and the cylinder-like tube 24 which next became the above-mentioned double composition -- an edge -- equip either metal mold 32a or 32b

[0087] \*\* -- a degree -- an edge -- metal mold 32a and 32b -- a cylinder -- the vertical edge of metal mold 31 -- fitting in -- the liquefied silicone rubber 22 -- an edge -- metal mold -- carry out pouring restoration by high pressure from the inlet 33 prepared in 32a in the gap of the above-mentioned rodding 21 and the above-mentioned fluororesin tube 23

[0088] While making it stick to the inner skin of circle metallic tube type 31, making the fluororesin tube 23 and the cylinder-like tube 24 extend by this filling pressure, the fluororesin tube 23 is made to unite with the silicone rubber material 22.

[0089] The bore of circle metallic tube type 31 has length which applied the thickness of the above-mentioned cylinder-like tube 24 to the outer diameter of the pressurization roller 20 which should be manufactured here.

[0090] Moreover, the release agent may be applied to the inside of circle metallic tube type 31, in order to make workability good, in case it unmolds from metal mold.

[0091] \*\* . The temperature of 70 degrees C - about 120 degrees C performs heating of 1 hour - 3 hours to metal mold in the state where it was equipped with and filled up with rodding 21, the liquefied silicone rubber 22, the fluororesin tube 23, and the cylinder-like tube 24, and it is made to harden silicone rubber 22.

[0092] \*\* -- after cooling -- each -- perform heat treatment of 3 hours - about 5 hours at the temperature of 180 degrees C - about 220 degrees C after removing metal mold and unmolding the pressurization roller 20

[0093] Consequently, the pressurization roller of a gestalt with which the cylinder-like tube 24 has covered the outside of the resin tube 23 as shown in (b) of drawing 3 is formed.

[0094] \*\* . -- without a fabrication operation company touches the front face of the fluororesin tube 23 by finally stripping off the cylinder-like tube 24 currently formed in the outside of the fluororesin tube 23 -- moreover, the front face of the fluororesin tube 23 -- a cylinder -- without the dirt of the inside of metal mold 31 adheres -- and a cylinder -- it becomes possible to obtain the good pressurization roller 20 of front-face nature hardly influenced by the blemish of the inside of metal mold 31 of an imprint

[0095] In this invention, although especially the kind of rubber of the elastic body layer 22 is not limited, in the case of a pressurization roller, the polyorganosiloxane constituent containing the vinyl group, i.e., silicone rubber, is common. As silicone rubber, what can be vulcanized, for example with a conventional peroxide like 2, the 5-dimethyl 2, and 5-di-tert-butyl peroxide hexane is used. SH52U, SH831U, SH841U, SH851U (above), etc. The tradename by Toray Industries Dow Corning, Inc., KE152U, KE153U, KE167U, KE172U, etc. TSE(above, tradename by Shin-Etsu Chemical Co., Ltd.)J21-3U, TSE221-4U, etc. can be illustrated (above, tradename by Toshiba Silicone, Inc.).

[0096] Moreover, in the elastic body layer 22, various additives, such as a bulking agent, an increase-in-quantity bulking agent, a vulcanizing agent, a coloring agent, conductive matter, a heat-resistant agent, and a pigment, can be added according to the purpose of use, the design objective, etc. of a pressurization roller.

[0097] For example, although especially the combination prescription of a bulking agent to the elastic body layer 22 is not restricted, 10-300 weight section grade addition of a reinforcement nature bulking agent and the increase-in-quantity bulking agent is usually carried out to the gum 100 weight section of the base.

[0098] As a reinforcement nature bulking agent, carbon black and a wet silica, and a dry type silica are common.

[0099] A wet silica here is a reinforcement nature silica which consists of a silicon dioxide, and there are various methods, such as a direct method which decomposes a specific silicate with a direct sulfuric acid, and an indirect method which a specific silicate is made to react with salts, is made to generate silicate, and is decomposed with a sulfuric acid or carbon dioxide gas next, as the manufacture method.

[0100] A dry type silica carries out heating reduction of the thermal decomposition method and silica sand of a silicon hafide, and is a reinforcement nature silica which consists of a silicon dioxide manufactured by the method of smothering evaporated SiO<sub>2</sub>, the thermal decomposition method of an organosilicon compound, etc.

[0101] In this invention, you may use a wet silica and a dry type silica if needed, using them together timely.

[0102] Furthermore, lubricant may be added for the purpose of prevention of the secondary combination by the activity on the front face of a silica, and silicon resins, alkoxysilane and siloxanes, a hydroxy silane and siloxanes, silazanes, organic-acid ester, polyhydric alcohol, etc. are illustrated as lubricant.

[0103] Moreover, it is a component required in order that an increase-in-quantity bulking agent may hold the function top property as elastic body layers, such as the mechanical characteristic of rubber, i.e., physical intensity, a rubber degree of hardness, and a compression set, and a calcium carbonate, quartz powder, a silicious marl, a novaculite, a silicic acid zirconium, \*\*\*\* aluminum, talc, a zinc oxide, a magnesium oxide, an iron oxide, a mica, graphite, etc. are illustrated.

[0104] Moreover, as a bulking agent for giving conductivity to the elastic body layer 22 if needed, generally conductive carbon black, such as acetylene black and KETCHIEN black, is used, and metal powders, such as graphite, silver, copper, and nickel, a conductive calcium carbonate, a carbon fiber, etc. are illustrated by others.



[0105] Moreover, the red ochre for rubber specified to SRIS110 (Society of Rubber Industry, Japan standard) is applicable as a coloring agent.

[0106] As a vulcanizing agent, in the case of hot cure type silicone rubber, the organic peroxide for silicone rubber can be applied to usual, and dicumyl peroxide, 2, 5 1 dimethyl 2, a 5-G (tertiary butylperoxy)-hexane, etc. are common.

[0107] The pressurization roller 20 manufactured by this example above was built into heating fixing equipment 6, and the mold-release characteristic was checked.

[0108] the metal mold same as a method -- 100 pressurization rollers were manufactured using 31, 32a, and 32b, and the durable test was performed about several [ of / it ] in addition, under pressurization roller manufacture -- metal mold -- especially 31, 32a, and 32b were continuously used without cleaning

[0109] Moreover, 100 pressurization rollers were similarly manufactured with the same metal mold by the method of the conventional example manufactured by the method of not using the cylinder-like tube 24 covered on the outside of a fluororesin tube 23 like this example as comparison, and the same durability was performed.

[0110] An evaluation result is shown in Table 1. In addition, 400,000 durability in image formation equipment was performed by continuation \*\*\*\*. The toner adhering to the pressurization roller front face was observed after durability, and the difference of toner coating weight estimated. A little, as for the beautiful state where O of front Naka does not have toner contamination, and \*\*, toner contamination shows a certain state, and, as for x, toner contamination shows an inferior state.

[0111]

[Table 1]

表 1

製造本数	10本目	20本目	40本目	70本目	100本目
本実施例	○	○	○	○	○
従来例	○	△	△	×	×

Since a state with a beautiful pressurization roller front face can be attained above according to this example, problems, such as contamination by toner adhesion, do not occur.

[0112] On the other hand, in the conventional example, there is an inclination for toner contamination of a pressurization roller to get worse according to the operating frequency of metal mold. For this reason, by the method of the conventional example, metal mold needed to be cleaned periodically, or it needed to reproduce, and a result to which a manufacturing cost is made to increase sharply was brought.

[0113] reducing the frequency in which dirt adhesion of the pressurization roller front face by dirt and the fabrication operation company of metal mold touching directly by this example above does not occur at all, but performs cleaning of metal mold, reproduction, etc. -- possible -- metal mold -- since a pressurization roller front face is hard to be transferred to the blemish of an inside -- metal mold -- the tolerance of the blemish of an inside increases sharply [0114] Consequently, good pressurization mouth-RA 20 of front-face nature is fully obtained, and when durability is incorporated and carried out to heating fixing equipment 6, problems, such as toner contamination, are not generated.

[0115] moreover -- this example -- metal mold -- although how to equip with rodding 21, the fluororesin tube 23, and the cylinder-like tube 24 simultaneously inside, and to manufacture a pressurization roller was shown, it is applicable also by the method of inserting the roller in the state where the elastic body layer 22 was formed in the rodding 21 after unrolling, into the fluororesin tube 23 That is, the roller in the state where the silicon sponge which foamed to the above-mentioned silicone rubber or silicone rubber material as an elastic body layer 22, and was formed was formed on rodding 21 with adhesives, such as added type silicone rubber, is cast or ground in a predetermined outer-diameter configuration. Then, from the outer diameter of this roller, it considers as the state where the fluororesin tube 23 of the double tube 23-24 in the state where the cylinder-like tube 24 explained to the outside of the non-shrinkage-characteristics fluororesin tube 23 of a minor diameter above was put was extended within the reduced pressure container, this roller (roller with which the elastic body layer 22 was formed in rodding 21) is returned to the ordinary pressure after insertion, and the fluororesin tube 23 is stuck on elastic body layer 22 front face.

[0116] Or each of the tube 23-24 of the above-mentioned double state is used as heat-shrinkable tubing, and it inserts into the fluororesin tube 23 of the tube 23-24 in the double state where the roller with which the above-mentioned elastic body layer 22 was formed was extended, and by heating, by the thermal contraction, the fluororesin tube 23 is stuck in the elastic body layer 22, and a pressurization roller is manufactured.

[0117] The pressurization roller of beautiful fluororesin tube covering of front-face nature is obtained by deleting only the cylinder-like tube 24 on the front face of the maximum after manufacturing the pressurization roller covered by the double tube 23-24 by the above method.

[0118] The material and the additive which were explained above as silicone rubber are used, and KE901U, KE903U,

KE904FU, etc. XE21-A9915 (above, tradename by Shin-Etsu Chemical Co., Ltd.) (tradename by Toshiba Silicone, Inc.), etc. are used timely with a foaming agent as silicon sponge rubber.

[0119] In addition, although the pressurization roller provided to heating fixing equipment explained in this example, it cannot be overemphasized that the manufacture method of this example is applicable to the various rollers which form the elastic body layer 22 and the fluororesin tube 23, and need the mold-release characteristic on the front face of a roller on a function on the metal rodding 21.

[0120] <The 2nd example> ( drawing 4 )

The 2nd example is explained below. Since the composition of the whole image formation equipment in this example and the composition of heating fixing equipment 6 are the same as that of the equipment of drawing 1 shown in the 1st example of the above, and drawing 2 , explanation for the second time is omitted.

[0121] In this example, it attaches in a circle metallic tube type inside, the member made of a resin which can remove is formed, and a pressurization roller is manufactured.

[0122] The detail of the pressurization roller manufacture method of this example is explained using drawing 5 .

Drawing 5 is the longitudinal-section model view of the equipment under pressurization roller manufacture. 34 is attached in the inside of circle metallic tube type 31, and it is the member made of a resin which can remove, and the bore is almost the same as the outer diameter made into the target of the pressurization roller to manufacture. It is the member which are polyester resin, such as polyamide resin, such as fluororesins, such as PFA, PTFE, and FEP, and nylon 6 which can be borne enough, Nylon 66, nylon 8 (N 1 METOROKISHI methylation nylon), Nylon 11, Nylon 12, and an aromatic polyamide, a polyethylene terephthalate, and polyp CHIREN terephthalate, polyphenylene sulfide (PPS), polyimide resin, etc. and by which the inside was kept smooth to pressurization roller burning temperature as a material of the member 34 made of a resin.

[0123] \*\*. -- this member 34 made of a resin -- a cylinder -- the state where it attached in the inside of metal mold 31 -- the pressurization roller rodding 21 and the fluororesin tube 23 -- an edge -- either metal mold 32a or 32b -- equipping -- an edge -- the cylinder with which metal mold 32a and 32b was attached in the member 34 made of a resin -- fit in with metal mold 31

[0124] \*\*. -- the 1st example 1 of the above showed in this state -- as -- the liquefied silicone rubber 22 -- an edge -- metal mold -- while carrying out pouring restoration by the high-pressure force and making the fluororesin tube 23 extend to the gap of the above-mentioned pressurization roller rodding 21 and the fluororesin tube 23 by the filling pressure from the inlet of 32a -- a cylinder -- make it stick to the inner skin of the member 34 made of a resin attached in the inside of metal mold 31, by heat-treating, carry out heat hardening of the silicone rubber

[0125] \*\*. -- a degree -- a pressurization roller -- an edge -- the cylinder with which metal mold 32a and 32b and the member 34 made of a resin were attached -- unmold from metal mold 31 and obtain the good pressurization roller of front-face nature

[0126] In addition, the member 34 made of a resin is removed from circle metallic tube type 31 after unmolding, and a pressurization roller with a fluororesin tube front face good [ front-face nature ] is always obtained by attaching the new member 34 made of a resin in circle metallic tube type 31 again.

[0127] after pressurization roller manufacture -- a cylinder -- or [ discarding the member 34 made of a resin which removed from metal mold 31 ] -- or it reproduces Or when this member 34 made of a resin is formed by PEEK, PPS, the polyimide, etc., even if it carries out number-of-times use of fixed, the front-face nature of fluororesin tube 23 superficies is kept good. For this reason, by exchanging after the number-of-times use of fixed, it always becomes the good fluororesin tube of front-face nature, and a circle metallic tube type can use almost eternally the cylinder resin member attached in a circle metallic tube type inside.

[0128] The good pressurization roller of front-face nature is not only always obtained, but above, by this example, since there is no time and effort, such as removing the cylinder-like tube of the maximum surface from the time and effort which piles up a thin tube-like member doubly, and metal mold after unmolding, workability becomes good. moreover, the product made of a resin -- since a pressurization roller maximum front face is formed along with the inner skin of metal mold -- a cylinder -- it becomes unnecessary to work cleaning especially the inner skin of metal mold etc.

[0129] In addition, although the pressurization roller was explained to the example like [ this example ] the 1st example of the above, it is not the manufacture method which also restricted this example to the pressurization roller.

[0130] The <3rd example> The 3rd example is explained below. Since the composition of the whole image formation equipment in this example and the composition of heating fixing equipment 6 are the same as that of the equipment of drawing 1 shown in the 1st example of the above, and drawing 2 , explanation for the second time is omitted.

[0131] In this example, the thermosetting resin layer is beforehand applied to the superficies of the fluororesin tube 23, metal mold is equipped in this state and a pressurization roller is manufactured.

[0132] The detail of the pressurization roller manufacture method by this example is shown below. In this example, the

silicon coating material to which resins, such as polyamide resin, polyester resin, urethane, acrylic resin, and the poly carbo, and HS-1, HS-2, HS-3 and HS-4 grade (tradename by Toshiba Silicone, Inc.) heat-harden is applied to the superficies of for example, a fluororesin tube as a protective layer the thickness of several micrometers - about 10 micrometers by the spray, a DIP, the brush, the flow, etc.

[0133] fluororesin tube superficies are direct by this protective layer -- metal mold -- inner skin is not contacted or a fabrication operation company's hand is not touched

[0134] The manufacture method is shown below.

[0135] \*\* . -- for example, the edge which showed the above-mentioned HS-2 in the 1st example of the above after \*\*\*\* by the state where it applied to the front face of the fluororesin tube 23 -- equip metal mold 32a or 32b with the pressurization roller rodding 21

[0136] \*\* . -- a degree -- the 1st example -- the same -- the edge of a vertical edge -- metal mold -- 32a and 32b -- a cylinder -- fit in with metal mold 31 this state -- the liquefied silicone rubber 22 -- an edge -- metal mold -- while carrying out pouring restoration by the high-pressure force and making the fluororesin tube 23 extend to the gap of the pressurization roller rodding 21 and the fluororesin tube 23 by the filling pressure from the inlet 33 of 32a -- a cylinder -- it is made to stick to the inner skin of metal mold 31, and heat hardening of the coating material applied to the superficies of silicone rubber 22 and the fluororesin tube 23 by heat-treating is carried out

[0137] \*\* . -- a degree -- a pressurization roller -- an edge -- metal mold 32a, 32b, and a cylinder -- unmold from metal mold 31, remove the coating material finally formed on the fluororesin tube 23, and obtain the good pressurization roller of front-face nature

[0138] Although the coating material was made into the shape of a tube by making it heat-harden here, you may make it the shape of a tube by UV hardening, and may be in a state with resin powder especially.

[0139] Above, by this example, in order to give good coating of a mold-release characteristic to the superficies of the fluororesin tube 23, there is no time and effort, such as putting a tube doubly, and workability becomes good. Moreover, it is easily removable by removing from the pressurization roller front face after manufacture by stiffening simultaneously with the pressurization roller elastic body layer 22 the coating material applied to fluororesin tube superficies, and making it the shape of a tube etc.

[0140] Moreover, it is also possible to form the mold-release characteristic tube of a thin film easily, without worsening workability compared with the cylinder-like tube covered on the superficies of the fluororesin tube shown in the 1st example of the above. For this reason, it is possible for the volume of the member removed to decrease and to decrease waste.

[0141] By this example, although this coating material is stiffened simultaneously with silicone rubber 22 after applying a mold-release characteristic coating material to the superficies of the fluororesin tube 23 and equipping metal mold, before equipping the metal mold for pressurization roller manufacture, the fluororesin tube 23 which applied the mold release coating material may be heated, and the coating material may be hardened after coating the fluororesin tube 23, here. In this case, you may adopt the method of covering the fluororesin tube 23 afterwards as the silicone rubber or silicon sponge which carried out rodding insertion.

[0142] In addition, although the pressurization roller was explained to the example like [ this example ] the 1st example of the above, it is not the manufacture method which also restricted this example to the pressurization roller.

[0143]

[Effect of the Invention] The heating fixing equipment possessing the fluororesin tube covering roller on which the mold-release characteristic on the front face of a roller was fully maintained, and this roller can be obtained without [ therefore ] making a front face produce an affix and a blemish, as explained above according to this invention.

[0144] Since a mold-release characteristic with the good pressurization roller front face in the state where it included in heating fixing equipment is acquired by this, accumulation of an offset toner etc. is mitigable.

[Translation done.]